

EasyPACK™ module with TRENCHSTOP™ 5 and Emitter Controlled 3 diode and PressFIT / NTC

Features

- Electrical features
 - $V_{CES} = 650 \text{ V}$
 - $I_{C\text{nom}} = 200 \text{ A} / I_{CRM} = 400 \text{ A}$
 - Low switching losses
- Mechanical features
 - Al_2O_3 substrate with low thermal resistance
 - Compact design
 - PressFIT contact technology
 - Integrated NTC temperature sensor
 - High power density



Potential applications

- Solar applications
- 3-level-applications

Product validation

- Qualified for industrial applications according to the relevant tests of IEC 60747, 60749 and 60068

Description

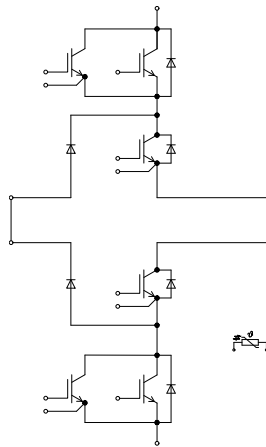


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1 Package

1 Package

Table 1 Insulation coordination

| Parameter | Symbol | Note or test condition | Values | Unit |
|----------------------------|-------------|--|-------------------------|------|
| Isolation test voltage | V_{ISOL} | RMS, $f = 50 \text{ Hz}$, $t = 1 \text{ min}$ | 3.2 | kV |
| Internal Isolation | | basic insulation (class 1, IEC 61140) | Al_2O_3 | |
| Creepage distance | d_{Creep} | terminal to heatsink | 11.2 | mm |
| Creepage distance | d_{Creep} | terminal to terminal | 6.8 | mm |
| Clearance | d_{Clear} | terminal to heatsink | 9.4 | mm |
| Clearance | d_{Clear} | terminal to terminal | 5.5 | mm |
| Comparative tracking index | CTI | | > 400 | |
| RTI Elec. | RTI | housing | 140 | °C |

Table 2 Characteristic values

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|------------------------------------|-----------|--|-----------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Stray inductance module | L_{SCE} | | | 12 | | nH |
| Storage temperature | T_{stg} | | -40 | | 125 | °C |
| Mounting torque for modul mounting | M | - Mounting according to valid application note | M5, Screw | 1.3 | 1.5 | Nm |
| Weight | G | | | 78 | | g |

Note: The current under continuous operation is limited to 25A rms per connector pin.

2 IGBT, T1.1 / T1.2 / T4.1 / T4.2

Table 3 Maximum rated values

| Parameter | Symbol | Note or test condition | Values | Unit |
|-----------------------------------|-----------|--|--------|------|
| Collector-emitter voltage | V_{CES} | $T_{vj} = 25 \text{ °C}$ | 650 | V |
| Implemented collector current | I_{CN} | | 200 | A |
| Continuous DC collector current | I_{CDC} | $T_{vj \text{ max}} = 175 \text{ °C}$ $T_H = 65 \text{ °C}$ | 130 | A |
| Repetitive peak collector current | I_{CRM} | $t_p = 1 \text{ ms}$ | 400 | A |
| Gate-emitter peak voltage | V_{GES} | | ±20 | V |

Table 4 Characteristic values

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|--|---------------|--|--------------------------|-------|-------|------------|
| | | | Min. | Typ. | Max. | |
| Collector-emitter saturation voltage | $V_{CE\ sat}$ | $I_C = 100\ A, V_{GE} = 15\ V$ | $T_{vj} = 25\ ^\circ C$ | 1.17 | 1.50 | V |
| | | | $T_{vj} = 125\ ^\circ C$ | 1.20 | | |
| | | | $T_{vj} = 150\ ^\circ C$ | 1.21 | | |
| Gate threshold voltage | V_{GEth} | $I_C = 2\ mA, V_{CE} = V_{GE}, T_{vj} = 25\ ^\circ C$ | 3.25 | 4 | 4.75 | V |
| Gate charge | Q_G | $V_{GE} = \pm 15\ V, V_{CE} = 400\ V$ | | 0.84 | | μC |
| Internal gate resistor | R_{Gint} | $T_{vj} = 25\ ^\circ C$ | | 0 | | Ω |
| Input capacitance | C_{ies} | $f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$ | | 14.3 | | nF |
| Reverse transfer capacitance | C_{res} | $f = 100\ kHz, T_{vj} = 25\ ^\circ C, V_{CE} = 25\ V, V_{GE} = 0\ V$ | | 0.05 | | nF |
| Collector-emitter cut-off current | I_{CES} | $V_{CE} = 650\ V, V_{GE} = 0\ V$ | $T_{vj} = 25\ ^\circ C$ | | 0.019 | mA |
| Gate-emitter leakage current | I_{GES} | $V_{CE} = 0\ V, V_{GE} = 20\ V, T_{vj} = 25\ ^\circ C$ | | | 100 | nA |
| Turn-on delay time (inductive load) | t_{don} | $I_C = 100\ A, V_{CE} = 300\ V, V_{GE} = \pm 15\ V, R_{Gon} = 4.7\ \Omega$ | $T_{vj} = 25\ ^\circ C$ | 0.022 | | μs |
| | | | $T_{vj} = 125\ ^\circ C$ | 0.021 | | |
| | | | $T_{vj} = 150\ ^\circ C$ | 0.021 | | |
| Rise time (inductive load) | t_r | $I_C = 100\ A, V_{CE} = 300\ V, V_{GE} = \pm 15\ V, R_{Gon} = 4.7\ \Omega$ | $T_{vj} = 25\ ^\circ C$ | 0.013 | | μs |
| | | | $T_{vj} = 125\ ^\circ C$ | 0.015 | | |
| | | | $T_{vj} = 150\ ^\circ C$ | 0.015 | | |
| Turn-off delay time (inductive load) | t_{doff} | $I_C = 100\ A, V_{CE} = 300\ V, V_{GE} = \pm 15\ V, R_{Goff} = 4.7\ \Omega$ | $T_{vj} = 25\ ^\circ C$ | 0.117 | | μs |
| | | | $T_{vj} = 125\ ^\circ C$ | 0.145 | | |
| | | | $T_{vj} = 150\ ^\circ C$ | 0.158 | | |
| Fall time (inductive load) | t_f | $I_C = 100\ A, V_{CE} = 300\ V, V_{GE} = \pm 15\ V, R_{Goff} = 4.7\ \Omega$ | $T_{vj} = 25\ ^\circ C$ | 0.044 | | μs |
| | | | $T_{vj} = 125\ ^\circ C$ | 0.046 | | |
| | | | $T_{vj} = 150\ ^\circ C$ | 0.047 | | |
| Turn-on energy loss per pulse | E_{on} | $I_C = 100\ A, V_{CE} = 300\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Gon} = 4.7\ \Omega, di/dt = 12.5\ kA/\mu s (T_{vj} = 150\ ^\circ C)$ | $T_{vj} = 25\ ^\circ C$ | 1 | | mJ |
| | | | $T_{vj} = 125\ ^\circ C$ | 1.4 | | |
| | | | $T_{vj} = 150\ ^\circ C$ | 1.49 | | |
| Turn-off energy loss per pulse | E_{off} | $I_C = 100\ A, V_{CE} = 300\ V, L_\sigma = 35\ nH, V_{GE} = \pm 15\ V, R_{Goff} = 4.7\ \Omega, dv/dt = 4400\ V/\mu s (T_{vj} = 150\ ^\circ C)$ | $T_{vj} = 25\ ^\circ C$ | 0.78 | | mJ |
| | | | $T_{vj} = 125\ ^\circ C$ | 1.28 | | |
| | | | $T_{vj} = 150\ ^\circ C$ | 1.4 | | |
| Thermal resistance, junction to heatsink | R_{thJH} | per IGBT, $\lambda_{grease} = 3.3\ W/(m^*K)$ | | 0.478 | | K/W |
| Temperature under switching conditions | $T_{vj\ op}$ | | -40 | | 150 | $^\circ C$ |

3 IGBT, T2 / T3

Table 5 Maximum rated values

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|-----------------------------------|-----------|---|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Collector-emitter voltage | V_{CES} | $T_{vj} = 25\text{ °C}$ | | 650 | | V |
| Implemented collector current | I_{CN} | | | 300 | | A |
| Continuous DC collector current | I_{CDC} | $T_{vj\ max} = 175\text{ °C}$ $T_H = 65\text{ °C}$ | | 255 | | A |
| Repetitive peak collector current | I_{CRM} | $t_p = 1\text{ ms}$ | | 600 | | A |
| Gate-emitter peak voltage | V_{GES} | | | ±20 | | V |

Table 6 Characteristic values

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|--------------------------------------|---------------|---|--------------------------|-------|-------|---------------|
| | | | Min. | Typ. | Max. | |
| Collector-emitter saturation voltage | $V_{CE\ sat}$ | $I_C = 100\text{ A}$, $V_{GE} = 15\text{ V}$ | $T_{vj} = 25\text{ °C}$ | 0.88 | 1.13 | V |
| | | | $T_{vj} = 125\text{ °C}$ | 0.80 | | |
| | | | $T_{vj} = 150\text{ °C}$ | 0.77 | | |
| Gate threshold voltage | V_{Geth} | $I_C = 4\text{ mA}$, $V_{CE} = 20\text{ V}$, $T_{vj} = 25\text{ °C}$ | 4.25 | 5 | 5.75 | V |
| Gate charge | Q_G | $V_{GE} = \pm 15\text{ V}$, $V_{CE} = 400\text{ V}$ | | 3.7 | | μC |
| Internal gate resistor | R_{Gint} | $T_{vj} = 25\text{ °C}$ | | 0 | | Ω |
| Input capacitance | C_{ies} | $f = 100\text{ kHz}$, $T_{vj} = 25\text{ °C}$, $V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$ | | 47.1 | | nF |
| Reverse transfer capacitance | C_{res} | $f = 100\text{ kHz}$, $T_{vj} = 25\text{ °C}$, $V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$ | | 0.168 | | nF |
| Collector-emitter cut-off current | I_{CES} | $V_{CE} = 650\text{ V}$, $V_{GE} = 0\text{ V}$ $T_{vj} = 25\text{ °C}$ | | | 0.019 | mA |
| Gate-emitter leakage current | I_{GES} | $V_{CE} = 0\text{ V}$, $V_{GE} = 20\text{ V}$, $T_{vj} = 25\text{ °C}$ | | | 100 | nA |
| Turn-on delay time (inductive load) | t_{don} | $I_C = 100\text{ A}$, $V_{CE} = 300\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 6.8\ \Omega$ | $T_{vj} = 25\text{ °C}$ | 0.128 | | μs |
| | | | $T_{vj} = 125\text{ °C}$ | 0.108 | | |
| | | | $T_{vj} = 150\text{ °C}$ | 0.103 | | |
| Rise time (inductive load) | t_r | $I_C = 100\text{ A}$, $V_{CE} = 300\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 6.8\ \Omega$ | $T_{vj} = 25\text{ °C}$ | 0.025 | | μs |
| | | | $T_{vj} = 125\text{ °C}$ | 0.030 | | |
| | | | $T_{vj} = 150\text{ °C}$ | 0.031 | | |
| Turn-off delay time (inductive load) | t_{doff} | $I_C = 100\text{ A}$, $V_{CE} = 300\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 6.8\ \Omega$ | $T_{vj} = 25\text{ °C}$ | 0.693 | | μs |
| | | | $T_{vj} = 125\text{ °C}$ | 0.821 | | |
| | | | $T_{vj} = 150\text{ °C}$ | 0.853 | | |

Table 6 Characteristic values (continued)

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|--|--------------------|--|--------------------------------------|-------|------|------------------|
| | | | Min. | Typ. | Max. | |
| Fall time (inductive load) | t_f | $I_C = 100\text{ A}$, $V_{CE} = 300\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 6.8\ \Omega$ | $T_{vj} = 25\text{ }^\circ\text{C}$ | 0.129 | | μs |
| | | | $T_{vj} = 125\text{ }^\circ\text{C}$ | 0.213 | | |
| | | | $T_{vj} = 150\text{ }^\circ\text{C}$ | 0.234 | | |
| Turn-on energy loss per pulse | E_{on} | $I_C = 100\text{ A}$, $V_{CE} = 300\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Gon} = 6.8\ \Omega$, $di/dt = 2700\text{ A}/\mu\text{s}$ ($T_{vj} = 150\text{ }^\circ\text{C}$) | $T_{vj} = 25\text{ }^\circ\text{C}$ | 1.06 | | mJ |
| | | | $T_{vj} = 125\text{ }^\circ\text{C}$ | 1.44 | | |
| | | | $T_{vj} = 150\text{ }^\circ\text{C}$ | 1.54 | | |
| Turn-off energy loss per pulse | E_{off} | $I_C = 100\text{ A}$, $V_{CE} = 300\text{ V}$, $L_\sigma = 35\text{ nH}$, $V_{GE} = \pm 15\text{ V}$, $R_{Goff} = 6.8\ \Omega$, $dv/dt = 760\text{ V}/\mu\text{s}$ ($T_{vj} = 150\text{ }^\circ\text{C}$) | $T_{vj} = 25\text{ }^\circ\text{C}$ | 5.24 | | mJ |
| | | | $T_{vj} = 125\text{ }^\circ\text{C}$ | 8.18 | | |
| | | | $T_{vj} = 150\text{ }^\circ\text{C}$ | 8.84 | | |
| Thermal resistance, junction to heatsink | R_{thJH} | per IGBT, $\lambda_{grease} = 3.3\text{ W}/(\text{m}^*\text{K})$ | | 0.300 | | K/W |
| Temperature under switching conditions | $T_{vj\text{ op}}$ | | -40 | | 150 | $^\circ\text{C}$ |

4 Diode, D1 / D4

Table 7 Maximum rated values

| Parameter | Symbol | Note or test condition | Values | Unit | |
|---------------------------------|-----------|---|--------------------------------------|------|----------------------|
| Repetitive peak reverse voltage | V_{RRM} | $T_{vj} = 25\text{ }^\circ\text{C}$ | 650 | V | |
| Implemented forward current | I_{FN} | | 225 | A | |
| Continuous DC forward current | I_F | | 100 | A | |
| Repetitive peak forward current | I_{FRM} | $t_p = 1\text{ ms}$ | 450 | A | |
| I^2t - value | I^2t | $V_R = 0\text{ V}$, $t_p = 10\text{ ms}$ | $T_{vj} = 125\text{ }^\circ\text{C}$ | 3030 | A^2s |
| | | | $T_{vj} = 150\text{ }^\circ\text{C}$ | 2760 | |

Table 8 Characteristic values

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|-----------------|--------|--|--------------------------------------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Forward voltage | V_F | $I_F = 100\text{ A}$, $V_{GE} = 0\text{ V}$ | $T_{vj} = 25\text{ }^\circ\text{C}$ | 1.26 | 1.55 | V |
| | | | $T_{vj} = 125\text{ }^\circ\text{C}$ | 1.16 | | |
| | | | $T_{vj} = 150\text{ }^\circ\text{C}$ | 1.11 | | |

Table 8 Characteristic values (continued)

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|--|--------------------|--|--------------------------|-------|------|--------------------|
| | | | Min. | Typ. | Max. | |
| Peak reverse recovery current | I_{RM} | $I_F = 100\text{ A}$, $V_R = 300\text{ V}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 2700\text{ A}/\mu\text{s}$ ($T_{vj} = 150\text{ °C}$) | $T_{vj} = 25\text{ °C}$ | 105 | | A |
| | | | $T_{vj} = 125\text{ °C}$ | 141 | | |
| | | | $T_{vj} = 150\text{ °C}$ | 151 | | |
| Recovered charge | Q_r | $I_F = 100\text{ A}$, $V_R = 300\text{ V}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 2700\text{ A}/\mu\text{s}$ ($T_{vj} = 150\text{ °C}$) | $T_{vj} = 25\text{ °C}$ | 5.94 | | μC |
| | | | $T_{vj} = 125\text{ °C}$ | 11.6 | | |
| | | | $T_{vj} = 150\text{ °C}$ | 13.5 | | |
| Reverse recovery energy | E_{rec} | $I_F = 100\text{ A}$, $V_R = 300\text{ V}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 2700\text{ A}/\mu\text{s}$ ($T_{vj} = 150\text{ °C}$) | $T_{vj} = 25\text{ °C}$ | 1.3 | | mJ |
| | | | $T_{vj} = 125\text{ °C}$ | 2.58 | | |
| | | | $T_{vj} = 150\text{ °C}$ | 3.01 | | |
| Thermal resistance, junction to heatsink | R_{thJH} | per diode, $\lambda_{grease} = 3.3\text{ W}/(\text{m}^2\text{K})$ | | 0.431 | | K/W |
| Temperature under switching conditions | $T_{vj\text{ op}}$ | | -40 | | 150 | $^{\circ}\text{C}$ |

5 Diode, D2 / D3

Table 9 Maximum rated values

| Parameter | Symbol | Note or test condition | Values | Unit | |
|---------------------------------|-----------|---|--------------------------|------|----------------------|
| Repetitive peak reverse voltage | V_{RRM} | $T_{vj} = 25\text{ °C}$ | 650 | V | |
| Implemented forward current | I_{FN} | | 225 | A | |
| Continuous DC forward current | I_F | | 100 | A | |
| Repetitive peak forward current | I_{FRM} | $t_p = 1\text{ ms}$ | 450 | A | |
| I^2t - value | I^2t | $V_R = 0\text{ V}$, $t_p = 10\text{ ms}$ | $T_{vj} = 125\text{ °C}$ | 3030 | A^2s |
| | | | $T_{vj} = 150\text{ °C}$ | 2760 | |

Table 10 Characteristic values

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|-----------------|--------|--|--------------------------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Forward voltage | V_F | $I_F = 100\text{ A}$, $V_{GE} = 0\text{ V}$ | $T_{vj} = 25\text{ °C}$ | 1.26 | 1.55 | V |
| | | | $T_{vj} = 125\text{ °C}$ | 1.16 | | |
| | | | $T_{vj} = 150\text{ °C}$ | 1.11 | | |

Table 10 Characteristic values (continued)

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|--|--------------------|--|--------------------------|-------|------|--------------------|
| | | | Min. | Typ. | Max. | |
| Peak reverse recovery current | I_{RM} | $I_F = 100\text{ A}$, $V_R = 300\text{ V}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 2700\text{ A}/\mu\text{s}$ ($T_{vj} = 150\text{ °C}$) | $T_{vj} = 25\text{ °C}$ | 105 | | A |
| | | | $T_{vj} = 125\text{ °C}$ | 141 | | |
| | | | $T_{vj} = 150\text{ °C}$ | 151 | | |
| Recovered charge | Q_r | $I_F = 100\text{ A}$, $V_R = 300\text{ V}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 2700\text{ A}/\mu\text{s}$ ($T_{vj} = 150\text{ °C}$) | $T_{vj} = 25\text{ °C}$ | 5.94 | | μC |
| | | | $T_{vj} = 125\text{ °C}$ | 11.6 | | |
| | | | $T_{vj} = 150\text{ °C}$ | 13.5 | | |
| Reverse recovery energy | E_{rec} | $I_F = 100\text{ A}$, $V_R = 300\text{ V}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 2700\text{ A}/\mu\text{s}$ ($T_{vj} = 150\text{ °C}$) | $T_{vj} = 25\text{ °C}$ | 1.3 | | mJ |
| | | | $T_{vj} = 125\text{ °C}$ | 2.58 | | |
| | | | $T_{vj} = 150\text{ °C}$ | 3.01 | | |
| Thermal resistance, junction to heatsink | R_{thJH} | per diode, $\lambda_{grease} = 3.3\text{ W}/(\text{m}^2\text{K})$ | | 0.390 | | K/W |
| Temperature under switching conditions | $T_{vj\text{ op}}$ | | -40 | | 150 | $^{\circ}\text{C}$ |

6 Diode, D5 / D6

Table 11 Maximum rated values

| Parameter | Symbol | Note or test condition | Values | Unit | |
|---------------------------------|-----------|---|--------------------------|------|----------------------|
| Repetitive peak reverse voltage | V_{RRM} | $T_{vj} = 25\text{ °C}$ | 650 | V | |
| Implemented forward current | I_{FN} | | 300 | A | |
| Continuous DC forward current | I_F | | 100 | A | |
| Repetitive peak forward current | I_{FRM} | $t_p = 1\text{ ms}$ | 600 | A | |
| I^2t - value | I^2t | $V_R = 0\text{ V}$, $t_p = 10\text{ ms}$ | $T_{vj} = 125\text{ °C}$ | 6610 | A^2s |
| | | | $T_{vj} = 150\text{ °C}$ | 6050 | |

Table 12 Characteristic values

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|-----------------|--------|--|--------------------------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Forward voltage | V_F | $I_F = 100\text{ A}$, $V_{GE} = 0\text{ V}$ | $T_{vj} = 25\text{ °C}$ | 1.19 | 1.47 | V |
| | | | $T_{vj} = 125\text{ °C}$ | 1.07 | | |
| | | | $T_{vj} = 150\text{ °C}$ | 1.02 | | |

Table 12 Characteristic values (continued)

| Parameter | Symbol | Note or test condition | Values | | | Unit |
|--|--------------------|---|--------------------------------------|-------|------|------------------|
| | | | Min. | Typ. | Max. | |
| Peak reverse recovery current | I_{RM} | $I_F = 100\text{ A}$, $V_R = 300\text{ V}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 12.5\text{ kA}/\mu\text{s}$ ($T_{vj} = 150\text{ }^\circ\text{C}$) | $T_{vj} = 25\text{ }^\circ\text{C}$ | 135 | | A |
| | | | $T_{vj} = 125\text{ }^\circ\text{C}$ | 186 | | |
| | | | $T_{vj} = 150\text{ }^\circ\text{C}$ | 199 | | |
| Recovered charge | Q_r | $I_F = 100\text{ A}$, $V_R = 300\text{ V}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 12.5\text{ kA}/\mu\text{s}$ ($T_{vj} = 150\text{ }^\circ\text{C}$) | $T_{vj} = 25\text{ }^\circ\text{C}$ | 5.05 | | μC |
| | | | $T_{vj} = 125\text{ }^\circ\text{C}$ | 12 | | |
| | | | $T_{vj} = 150\text{ }^\circ\text{C}$ | 14.4 | | |
| Reverse recovery energy | E_{rec} | $I_F = 100\text{ A}$, $V_R = 300\text{ V}$, $V_{GE} = -15\text{ V}$, $-di_F/dt = 12.5\text{ kA}/\mu\text{s}$ ($T_{vj} = 150\text{ }^\circ\text{C}$) | $T_{vj} = 25\text{ }^\circ\text{C}$ | 0.931 | | mJ |
| | | | $T_{vj} = 125\text{ }^\circ\text{C}$ | 2.64 | | |
| | | | $T_{vj} = 150\text{ }^\circ\text{C}$ | 3.26 | | |
| Thermal resistance, junction to heatsink | R_{thJH} | per diode, $\lambda_{grease} = 3.3\text{ W}/(\text{m}^*\text{K})$ | | 0.479 | | K/W |
| Temperature under switching conditions | $T_{vj\text{ op}}$ | | -40 | | 150 | $^\circ\text{C}$ |

7 NTC-Thermistor

Table 13 Characteristic values

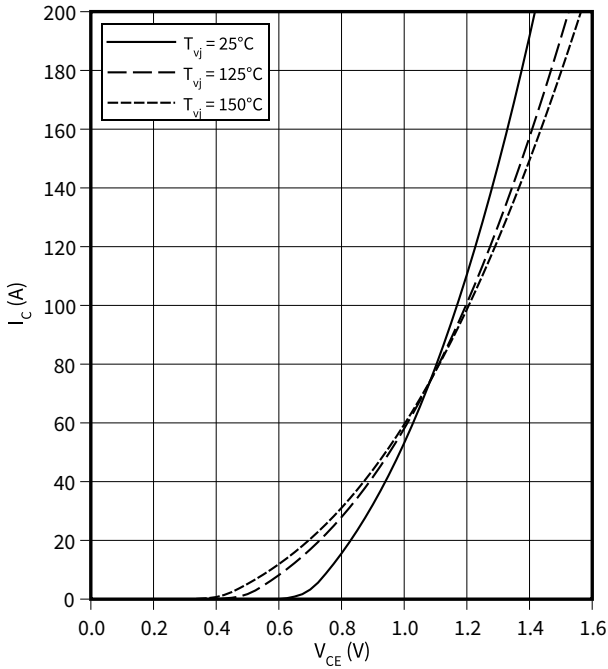
| Parameter | Symbol | Note or test condition | Values | | | Unit |
|------------------------|--------------|---|--------|------|------|------------|
| | | | Min. | Typ. | Max. | |
| Rated resistance | R_{25} | $T_{NTC} = 25\text{ }^\circ\text{C}$ | | 5 | | k Ω |
| Deviation of R_{100} | $\Delta R/R$ | $T_{NTC} = 100\text{ }^\circ\text{C}$, $R_{100} = 493\text{ }\Omega$ | -5 | | 5 | % |
| Power dissipation | P_{25} | $T_{NTC} = 25\text{ }^\circ\text{C}$ | | | 20 | mW |
| B-value | $B_{25/50}$ | $R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298,15\text{ K}))]$ | | 3375 | | K |
| B-value | $B_{25/80}$ | $R_2 = R_{25} \exp[B_{25/80}(1/T_2 - 1/(298,15\text{ K}))]$ | | 3411 | | K |
| B-value | $B_{25/100}$ | $R_2 = R_{25} \exp[B_{25/100}(1/T_2 - 1/(298,15\text{ K}))]$ | | 3433 | | K |

Note: Specification according to the valid application note.

8 Characteristics diagrams

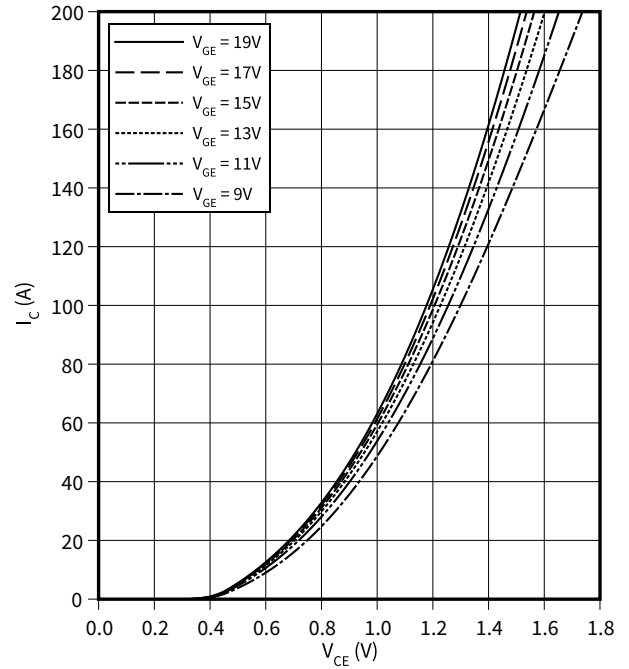
output characteristic (typical), IGBT, T1.1 / T1.2 / T4.1 / T4.2

$I_C = f(V_{CE})$
 $V_{GE} = 15\text{ V}$



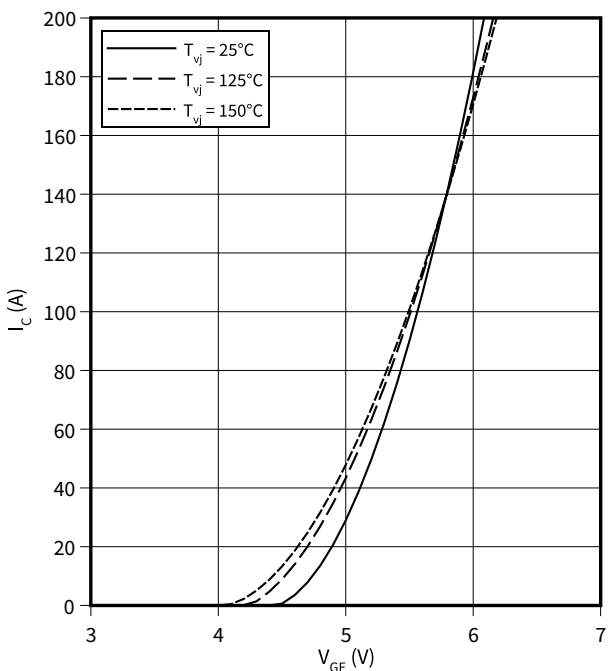
output characteristic (typical), IGBT, T1.1 / T1.2 / T4.1 / T4.2

$I_C = f(V_{CE})$
 $T_{vj} = 150\text{ °C}$



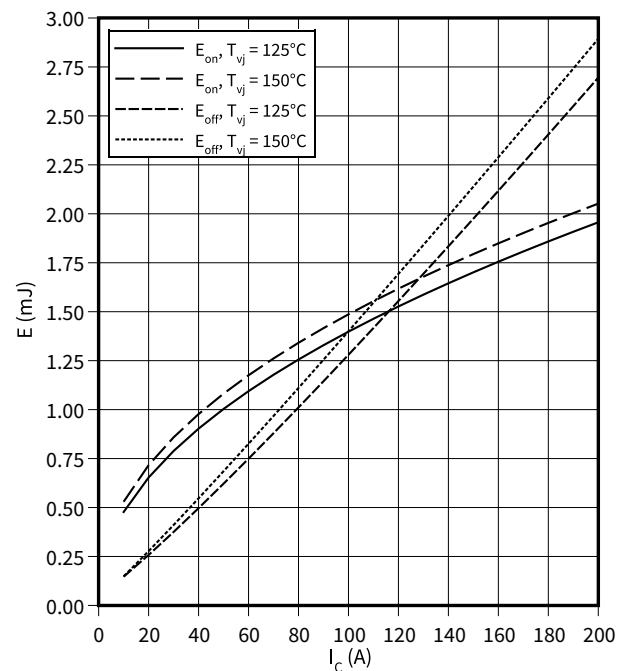
transfer characteristic (typical), IGBT, T1.1 / T1.2 / T4.1 / T4.2

$I_C = f(V_{GE})$
 $V_{CE} = 20\text{ V}$



switching losses (typical), IGBT, T1.1 / T1.2 / T4.1 / T4.2

$E = f(I_C)$
 $R_{Goff} = 4.7\ \Omega$, $R_{Gon} = 4.7\ \Omega$, $V_{CE} = 300\text{ V}$, $V_{GE} = \pm 15\text{ V}$

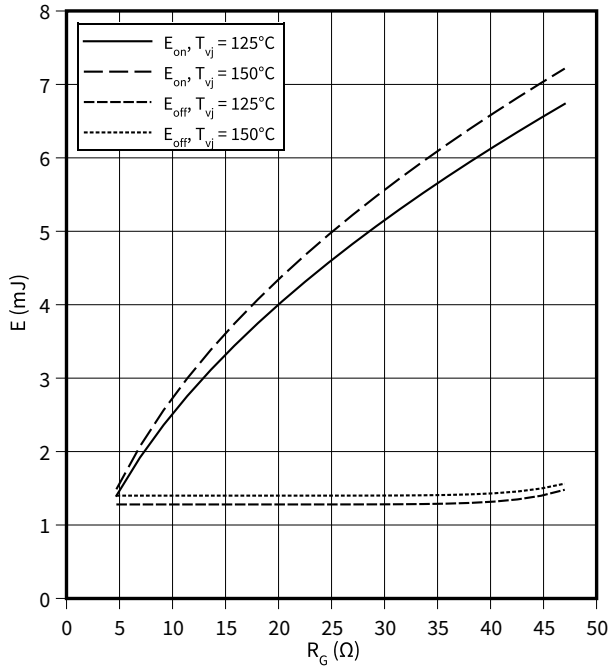


8 Characteristics diagrams

switching losses (typical), IGBT, T1.1 / T1.2 / T4.1 / T4.2

$E = f(R_G)$

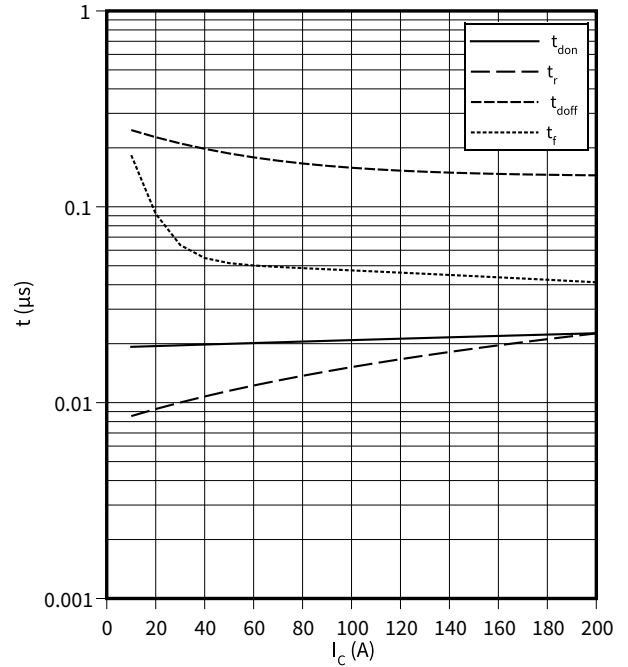
$I_C = 100 \text{ A}, V_{CE} = 300 \text{ V}, V_{GE} = \pm 15 \text{ V}$



switching times (typical), IGBT, T1.1 / T1.2 / T4.1 / T4.2

$t = f(I_C)$

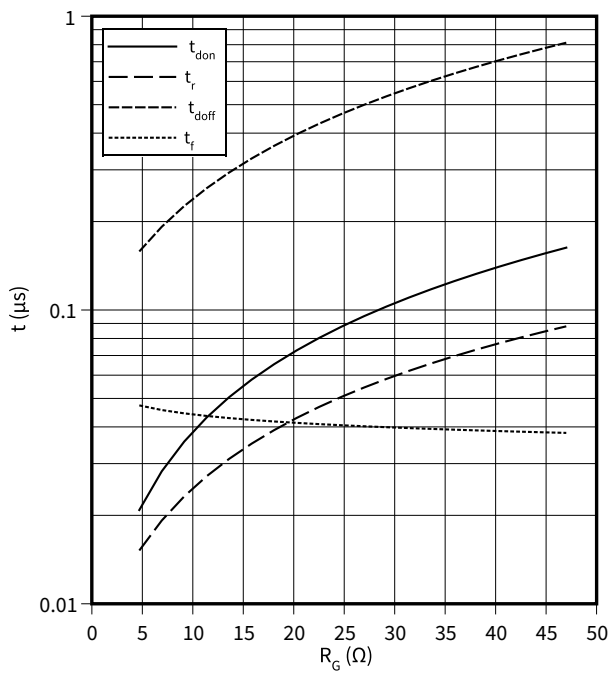
$R_{Goff} = 4.7 \Omega, R_{Gon} = 4.7 \Omega, V_{CE} = 300 \text{ V}, V_{GE} = \pm 15 \text{ V}, T_{vj} = 150 \text{ }^\circ\text{C}$



switching times (typical), IGBT, T1.1 / T1.2 / T4.1 / T4.2

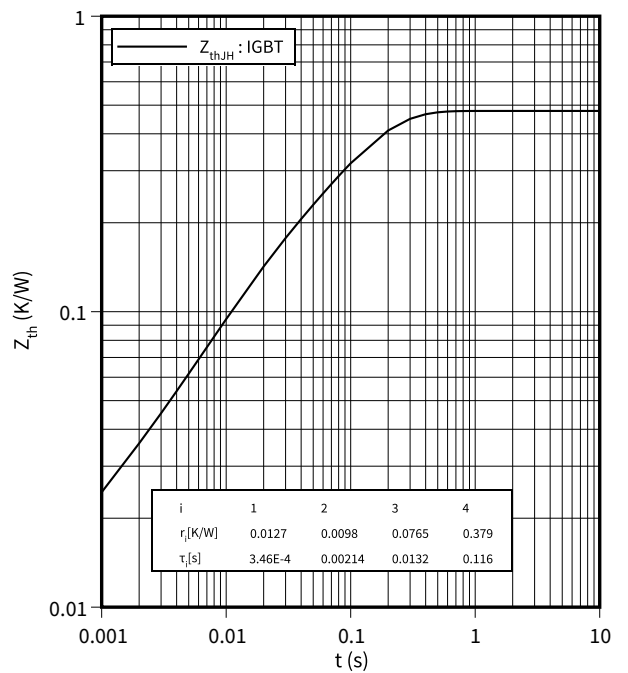
$t = f(R_G)$

$I_C = 100 \text{ A}, V_{CE} = 300 \text{ V}, V_{GE} = \pm 15 \text{ V}, T_{vj} = 150 \text{ }^\circ\text{C}$



transient thermal impedance, IGBT, T1.1 / T1.2 / T4.1 / T4.2

$Z_{th} = f(t)$

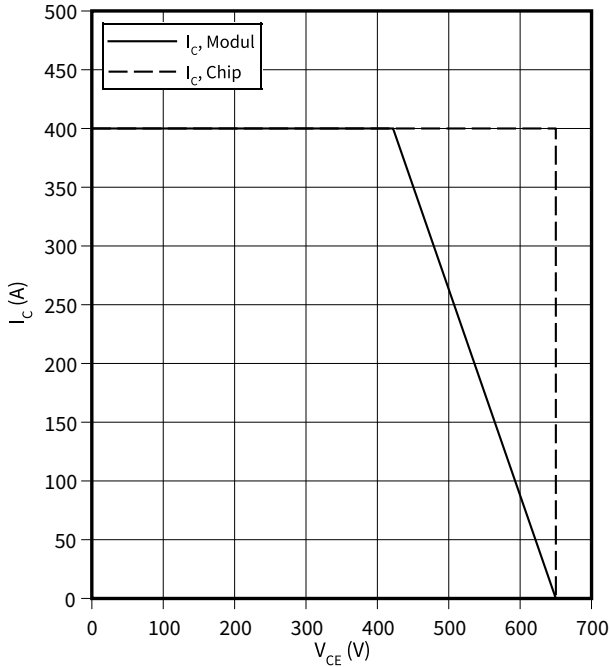


8 Characteristics diagrams

reverse bias safe operating area (RBSOA), IGBT, T1.1 / T1.2 / T4.1 / T4.2

$I_C = f(V_{CE})$

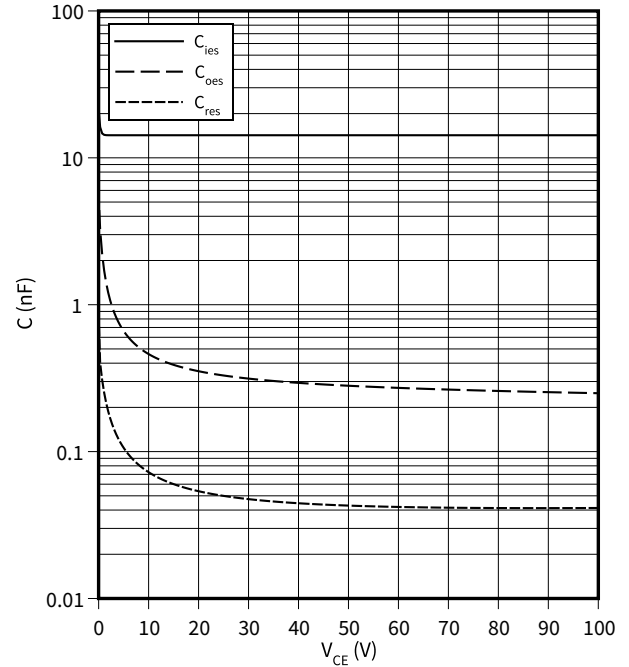
$R_{Goff} = 4.7 \Omega, V_{GE} = \pm 15 V, T_{vj} = 150 \text{ }^\circ\text{C}$



capacity characteristic (typical), IGBT, T1.1 / T1.2 / T4.1 / T4.2

$C = f(V_{CE})$

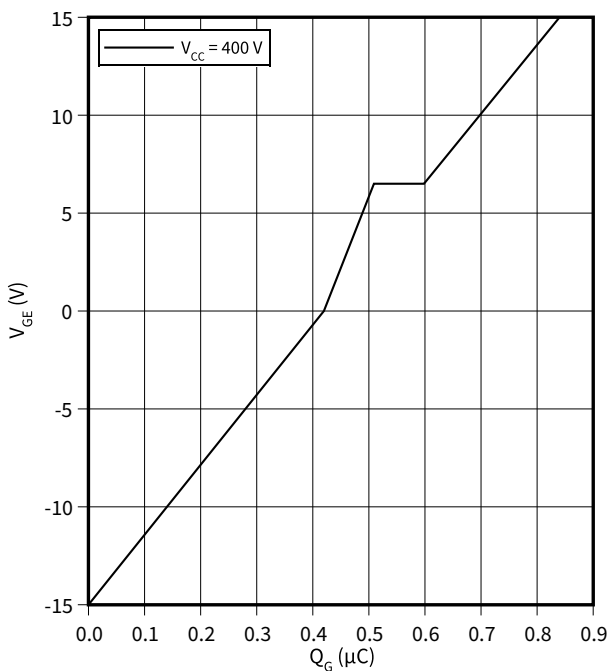
$f = 100 \text{ kHz}, V_{GE} = 0 V, T_{vj} = 25 \text{ }^\circ\text{C}$



gate charge characteristic (typical), IGBT, T1.1 / T1.2 / T4.1 / T4.2

$V_{GE} = f(Q_G)$

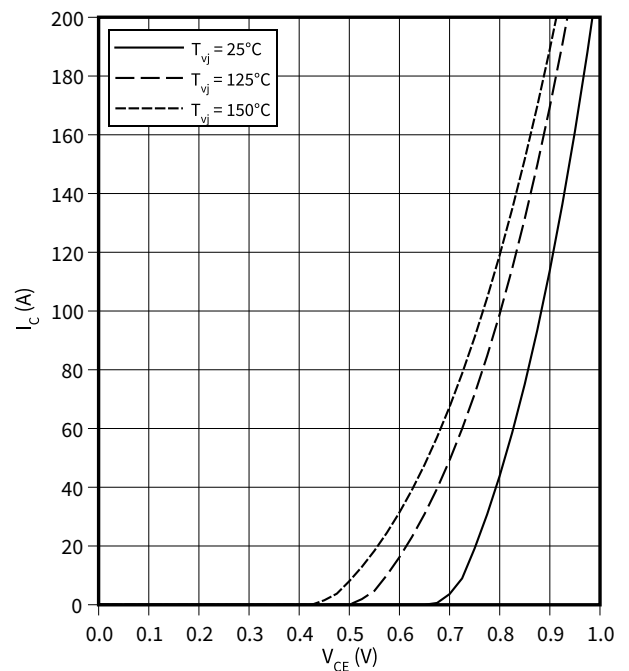
$I_C = 200 A, T_{vj} = 25 \text{ }^\circ\text{C}$



output characteristic (typical), IGBT, T2 / T3

$I_C = f(V_{CE})$

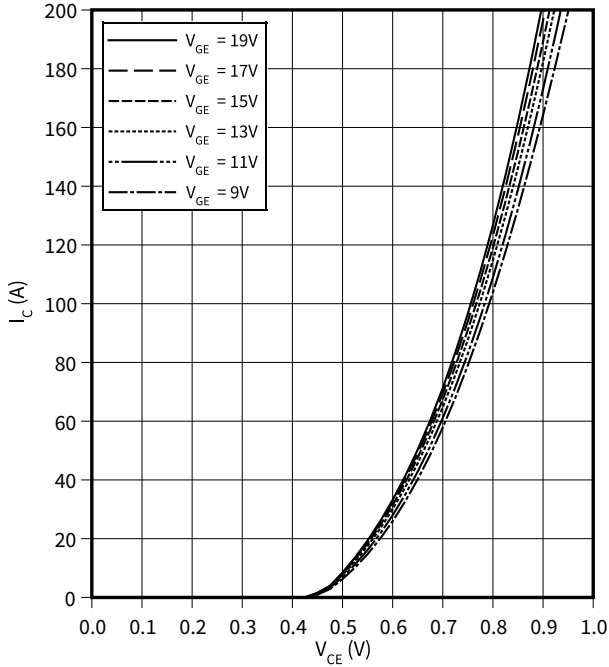
$V_{GE} = 15 V$



8 Characteristics diagrams

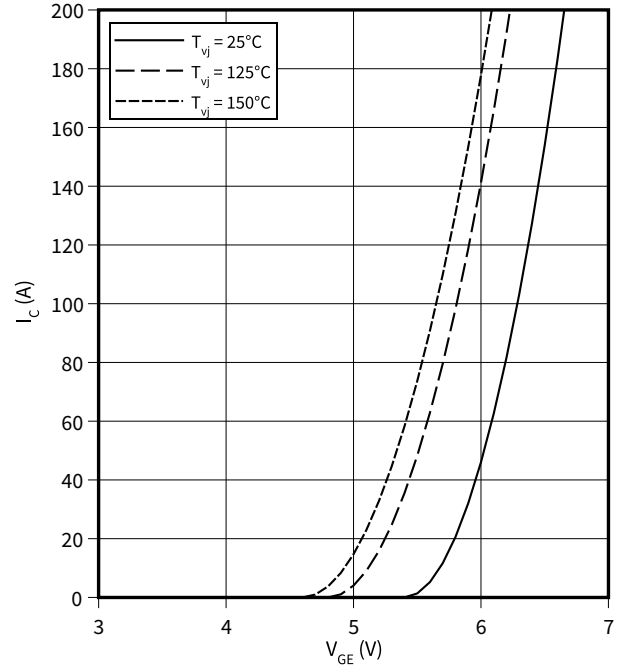
output characteristic (typical), IGBT, T2 / T3

$I_C = f(V_{CE})$
 $T_{vj} = 150\text{ °C}$



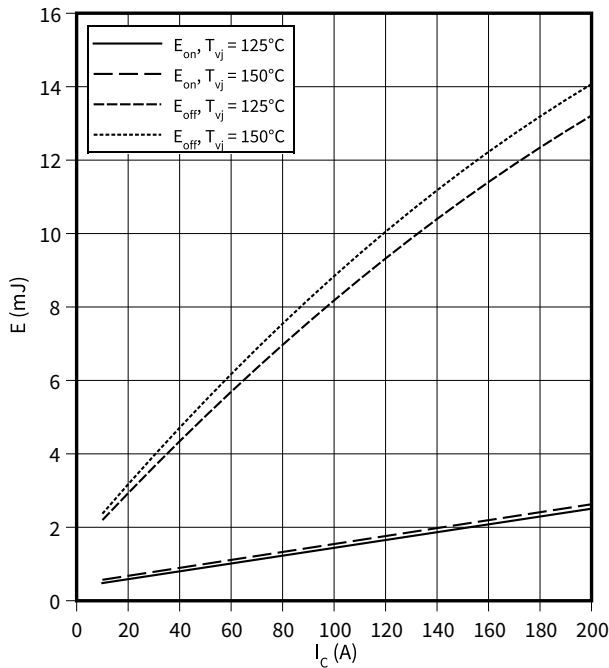
transfer characteristic (typical), IGBT, T2 / T3

$I_C = f(V_{GE})$
 $V_{CE} = 20\text{ V}$



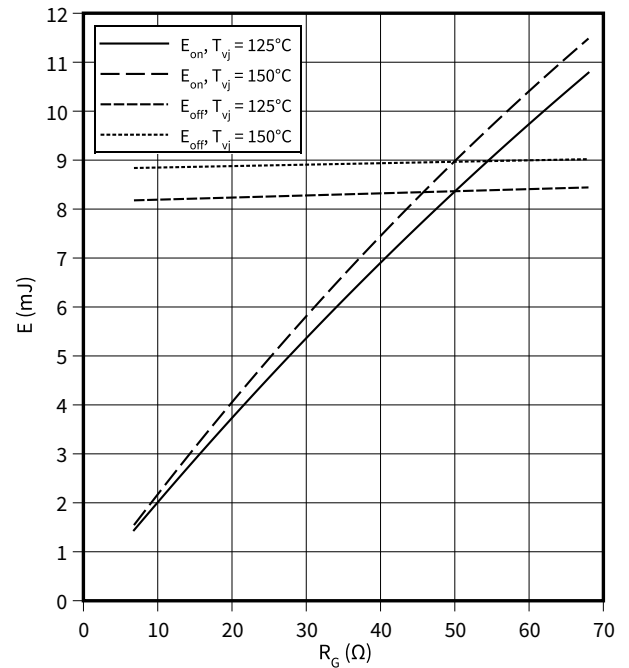
switching losses (typical), IGBT, T2 / T3

$E = f(I_C)$
 $R_{Goff} = 6.8\ \Omega$, $R_{Gon} = 6.8\ \Omega$, $V_{CE} = 300\text{ V}$, $V_{GE} = \pm 15\text{ V}$



switching losses (typical), IGBT, T2 / T3

$E = f(R_G)$
 $I_C = 100\text{ A}$, $V_{CE} = 300\text{ V}$, $V_{GE} = \pm 15\text{ V}$

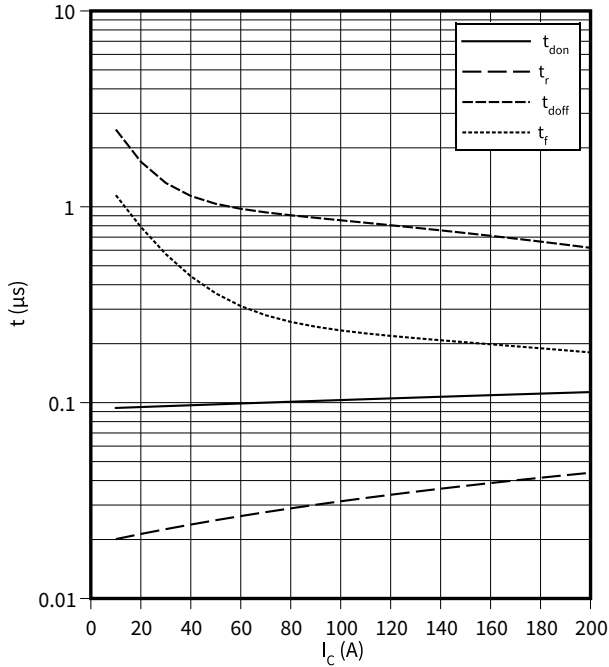


8 Characteristics diagrams

switching times (typical), IGBT, T2 / T3

$t = f(I_C)$

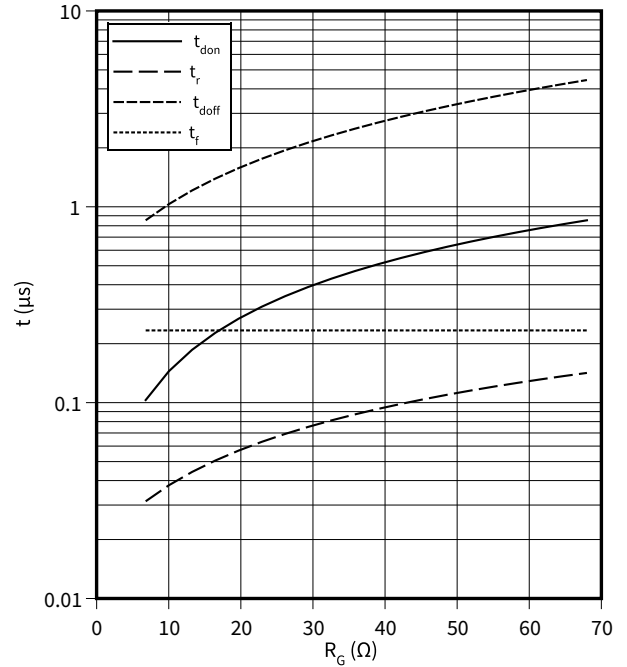
$R_{Goff} = 6.8 \Omega$, $R_{Gon} = 6.8 \Omega$, $V_{CE} = 300 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $T_{vj} = 150 \text{ }^\circ\text{C}$



switching times (typical), IGBT, T2 / T3

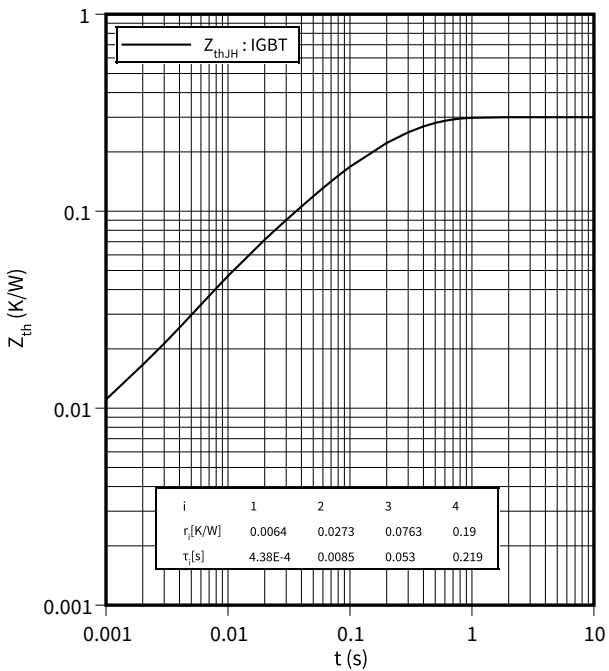
$t = f(R_G)$

$I_C = 100 \text{ A}$, $V_{CE} = 300 \text{ V}$, $V_{GE} = \pm 15 \text{ V}$, $T_{vj} = 150 \text{ }^\circ\text{C}$



transient thermal impedance, IGBT, T2 / T3

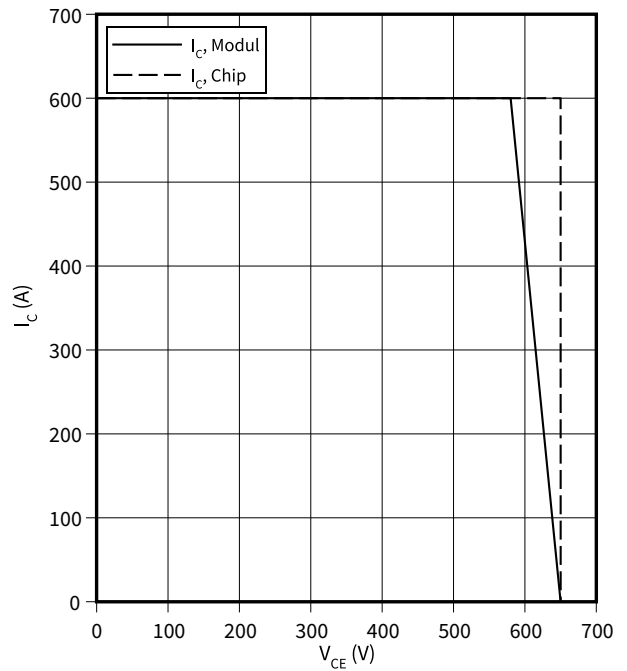
$Z_{th} = f(t)$



reverse bias safe operating area (RBSOA), IGBT, T2 / T3

$I_C = f(V_{CE})$

$R_{Goff} = 6.8 \Omega$, $V_{GE} = \pm 15 \text{ V}$, $T_{vj} = 150 \text{ }^\circ\text{C}$

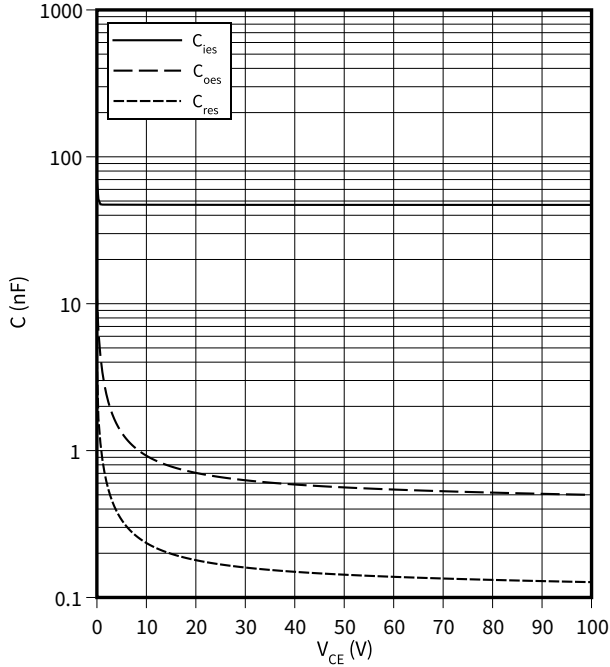


8 Characteristics diagrams

capacity characteristic (typical), IGBT, T2 / T3

$C = f(V_{CE})$

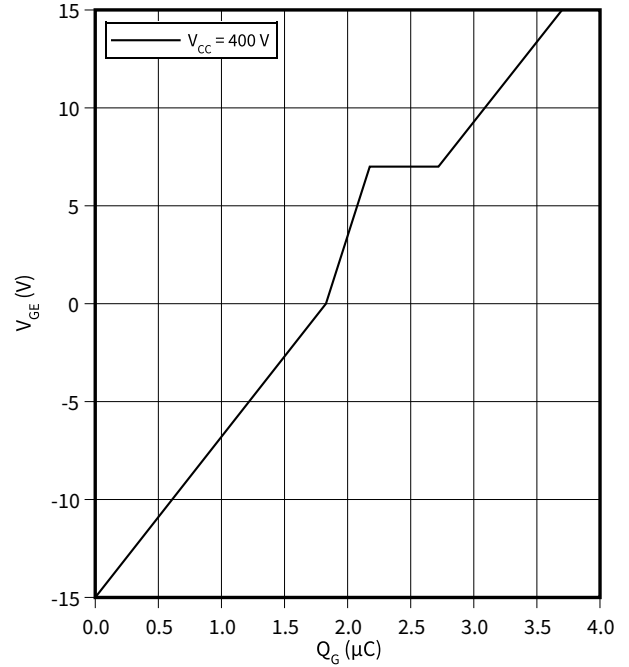
$f = 100 \text{ kHz}, V_{GE} = 0 \text{ V}, T_{vj} = 25 \text{ }^\circ\text{C}$



gate charge characteristic (typical), IGBT, T2 / T3

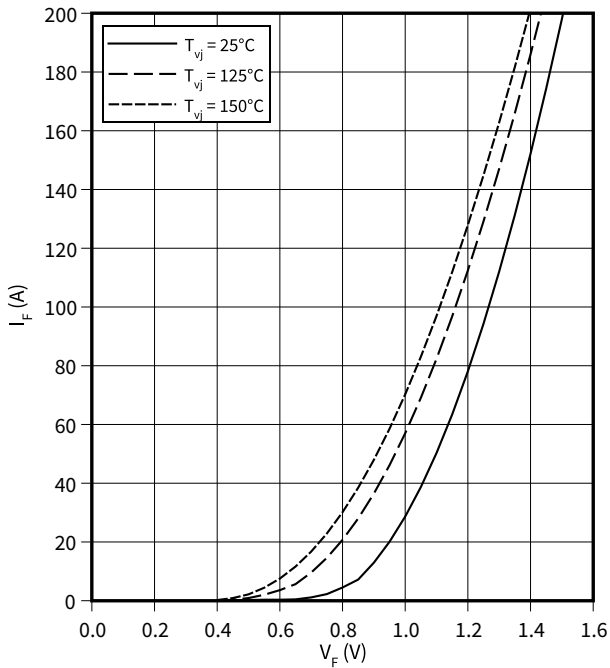
$V_{GE} = f(Q_G)$

$I_C = 200 \text{ A}, T_{vj} = 25 \text{ }^\circ\text{C}$



forward characteristic (typical), Diode, D1 / D4

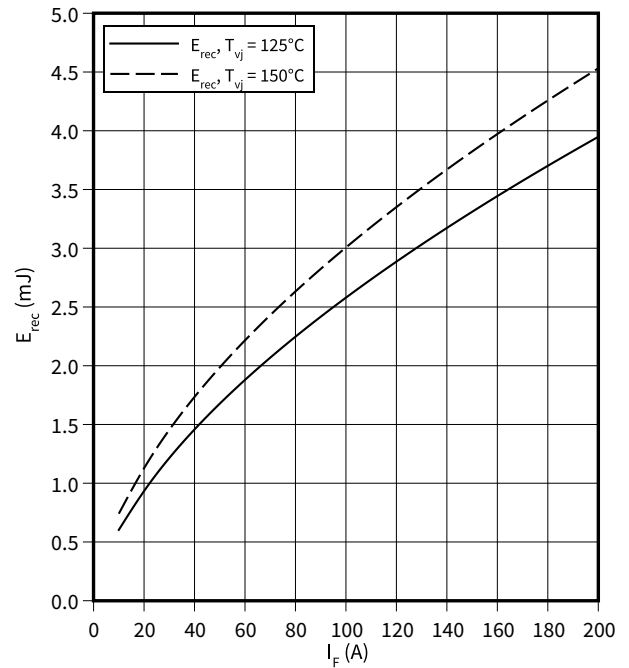
$I_F = f(V_F)$



switching losses (typical), Diode, D1 / D4

$E_{rec} = f(I_F)$

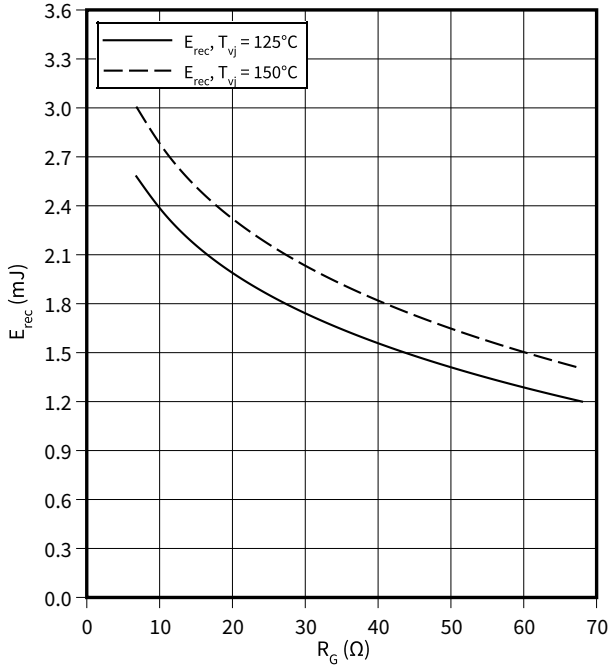
$R_{Gon} = 6.8 \text{ } \Omega, V_{CE} = 300 \text{ V}$



8 Characteristics diagrams

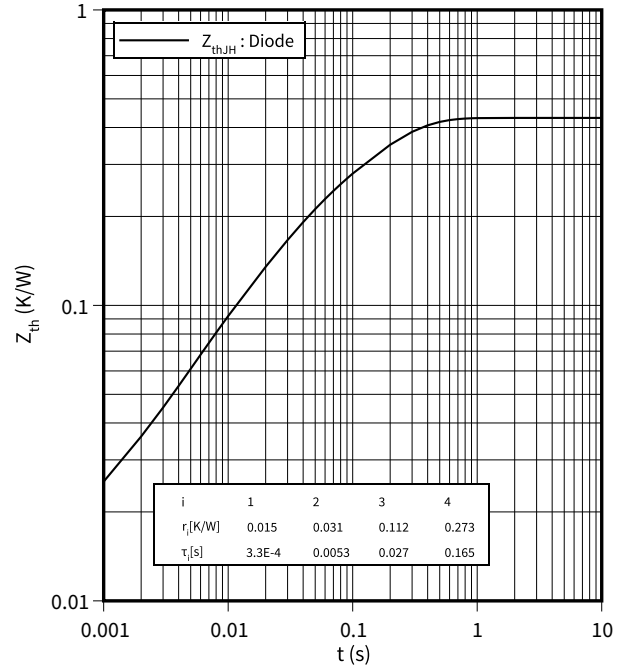
switching losses (typical), Diode, D1 / D4

$E_{rec} = f(R_G)$
 $V_{CE} = 300\text{ V}, I_F = 100\text{ A}$



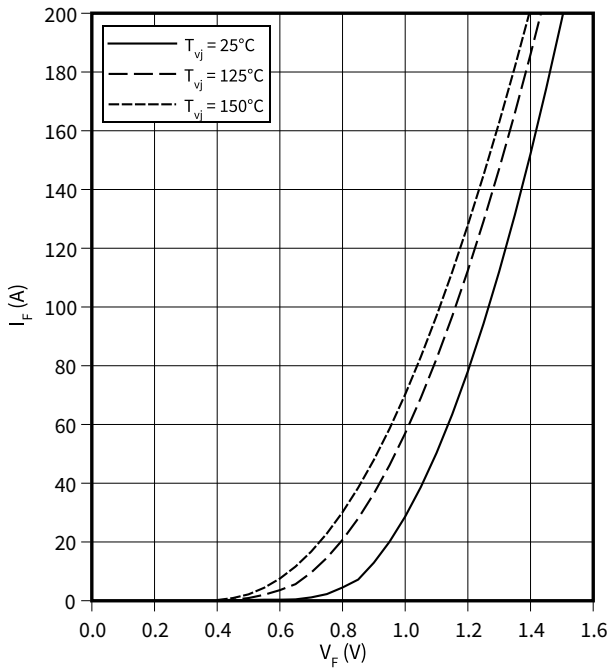
transient thermal impedance, Diode, D1 / D4

$Z_{th} = f(t)$



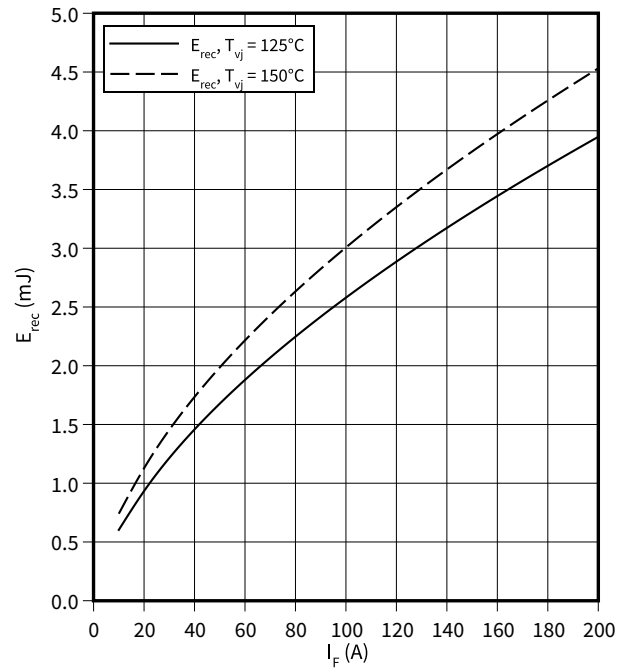
forward characteristic (typical), Diode, D2 / D3

$I_F = f(V_F)$



switching losses (typical), Diode, D2 / D3

$E_{rec} = f(I_F)$
 $R_{Gon} = 6.8\ \Omega, V_{CE} = 300\text{ V}$

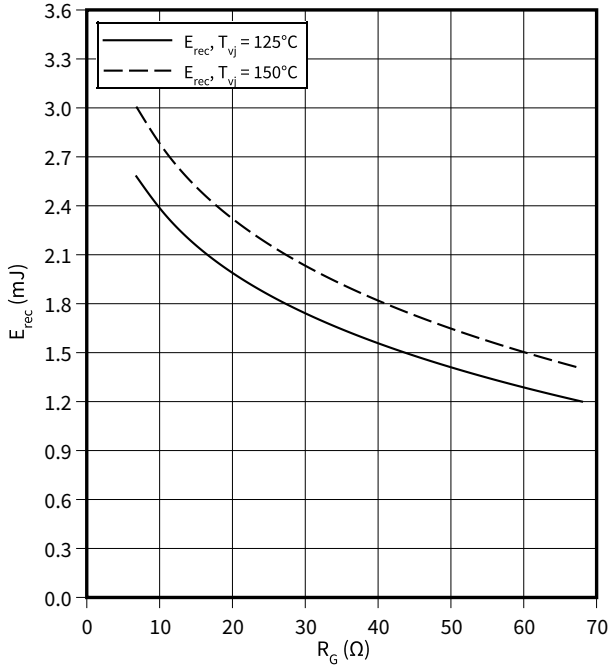


8 Characteristics diagrams

switching losses (typical), Diode, D2 / D3

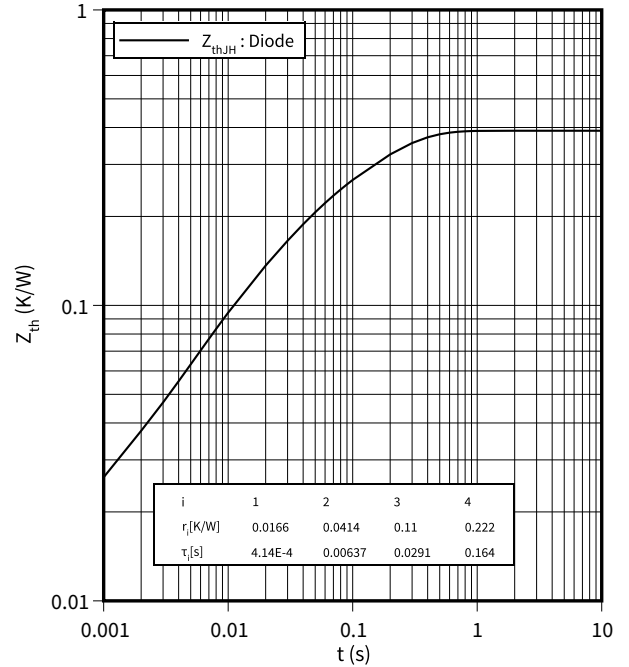
$E_{rec} = f(R_G)$

$V_{CE} = 300\text{ V}, I_F = 100\text{ A}$



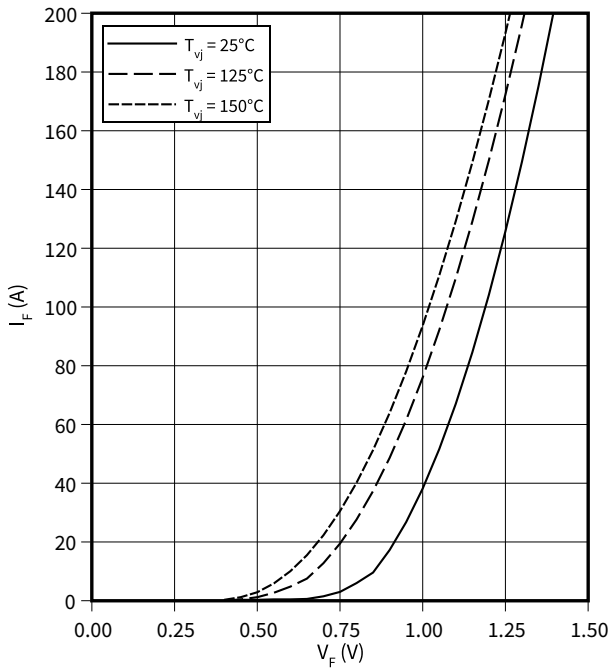
transient thermal impedance, Diode, D2 / D3

$Z_{th} = f(t)$



forward characteristic of (typical), Diode, D5 / D6

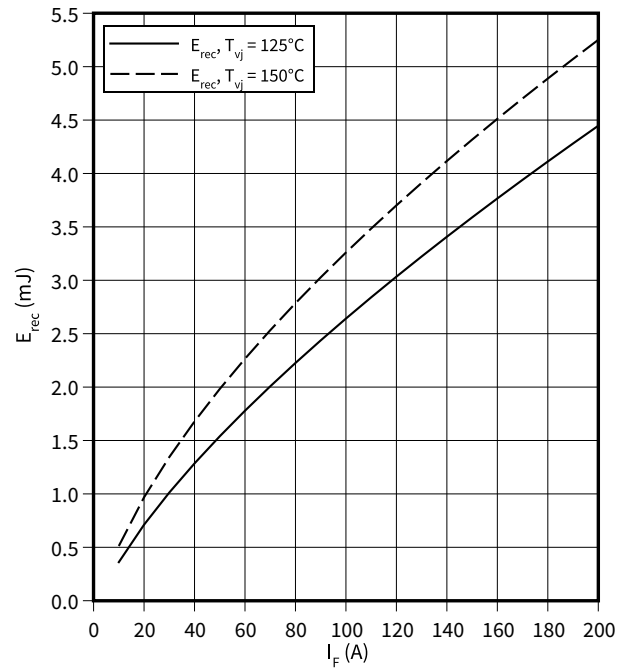
$I_F = f(V_F)$



switching losses (typical), Diode, D5 / D6

$E_{rec} = f(I_F)$

$R_{Gon} = 4.7\ \Omega, V_{CE} = 300\text{ V}$

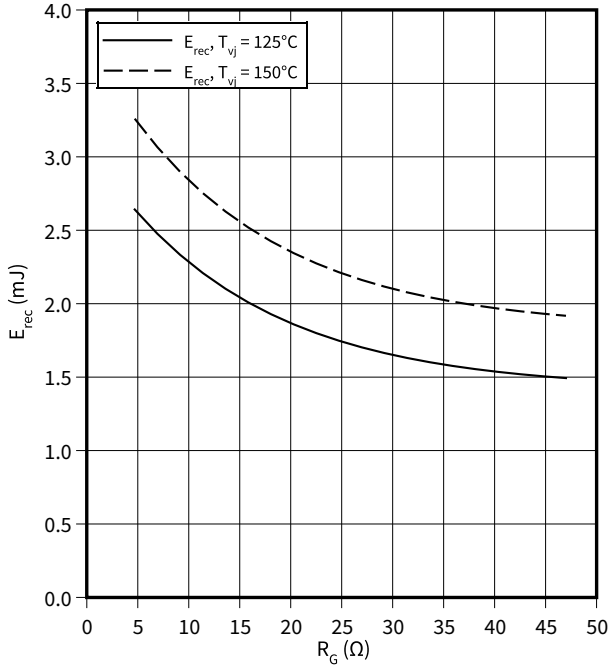


8 Characteristics diagrams

switching losses (typical), Diode, D5 / D6

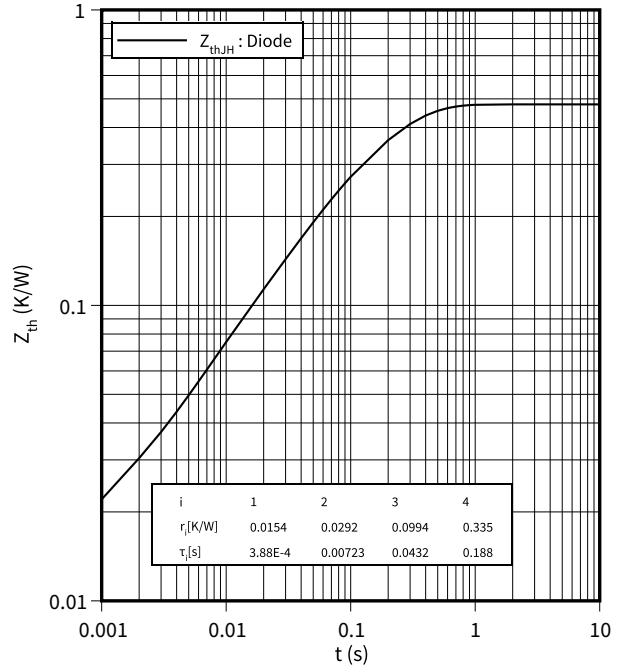
$E_{rec} = f(R_G)$

$V_{CE} = 300\text{ V}, I_F = 100\text{ A}$



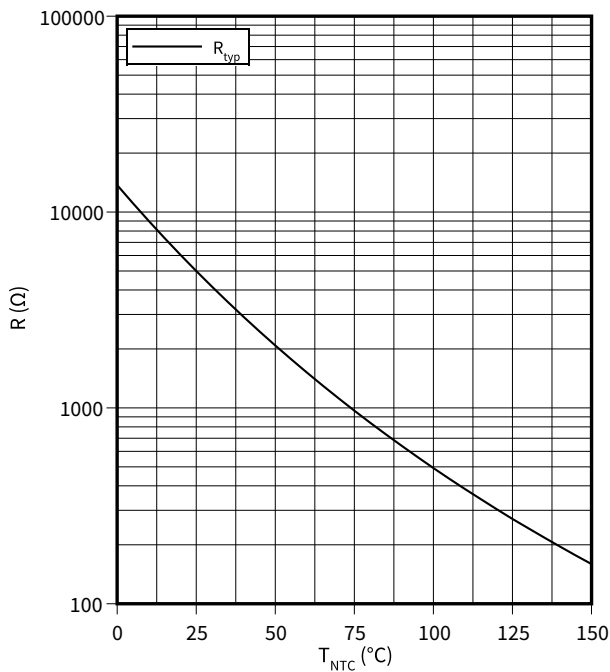
transient thermal impedance , Diode, D5 / D6

$Z_{th} = f(t)$



temperature characteristic (typical), NTC-Thermistor

$R = f(T_{NTC})$



9 Circuit diagram

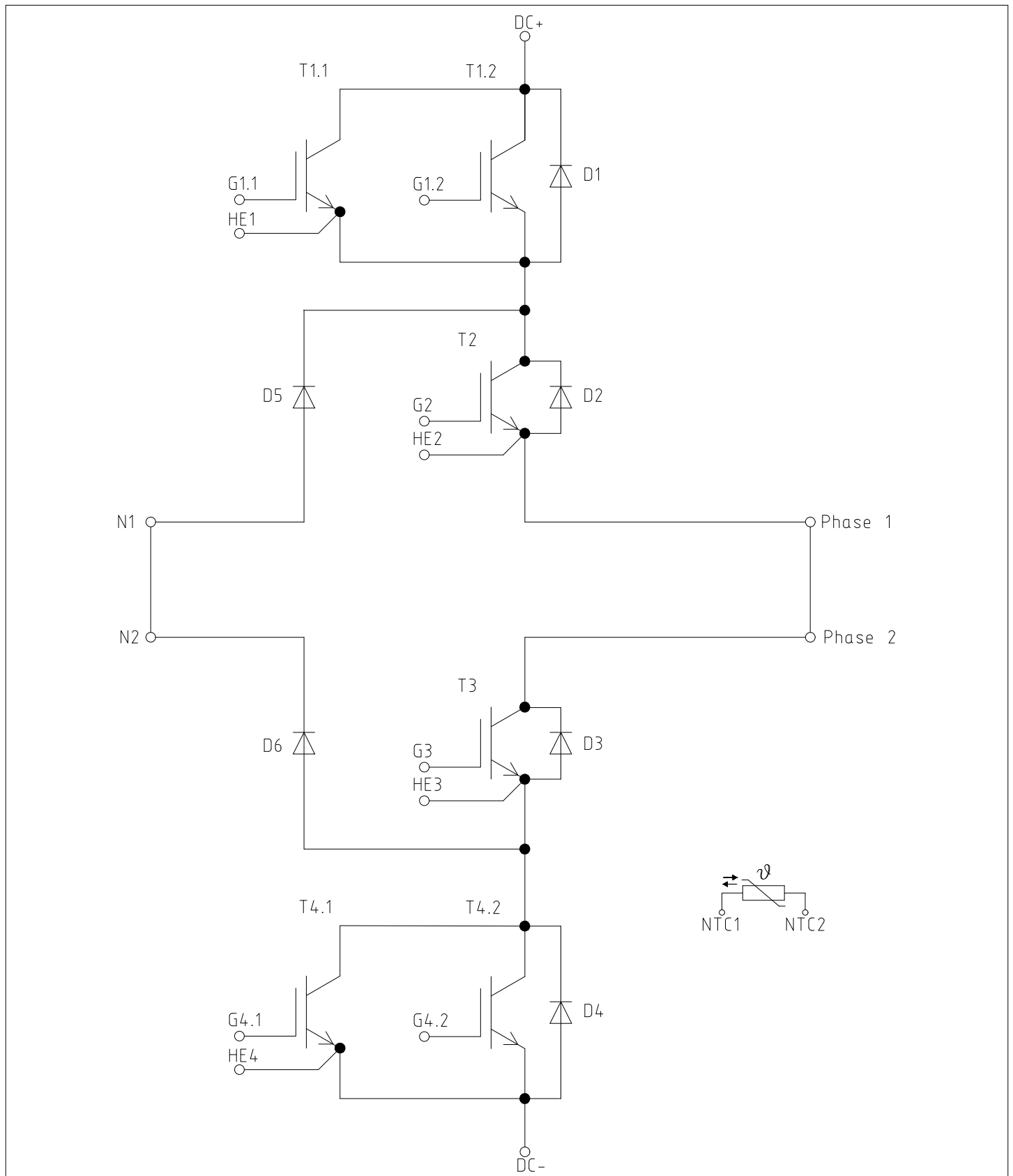


Figure 2

10 Package outlines

10 Package outlines

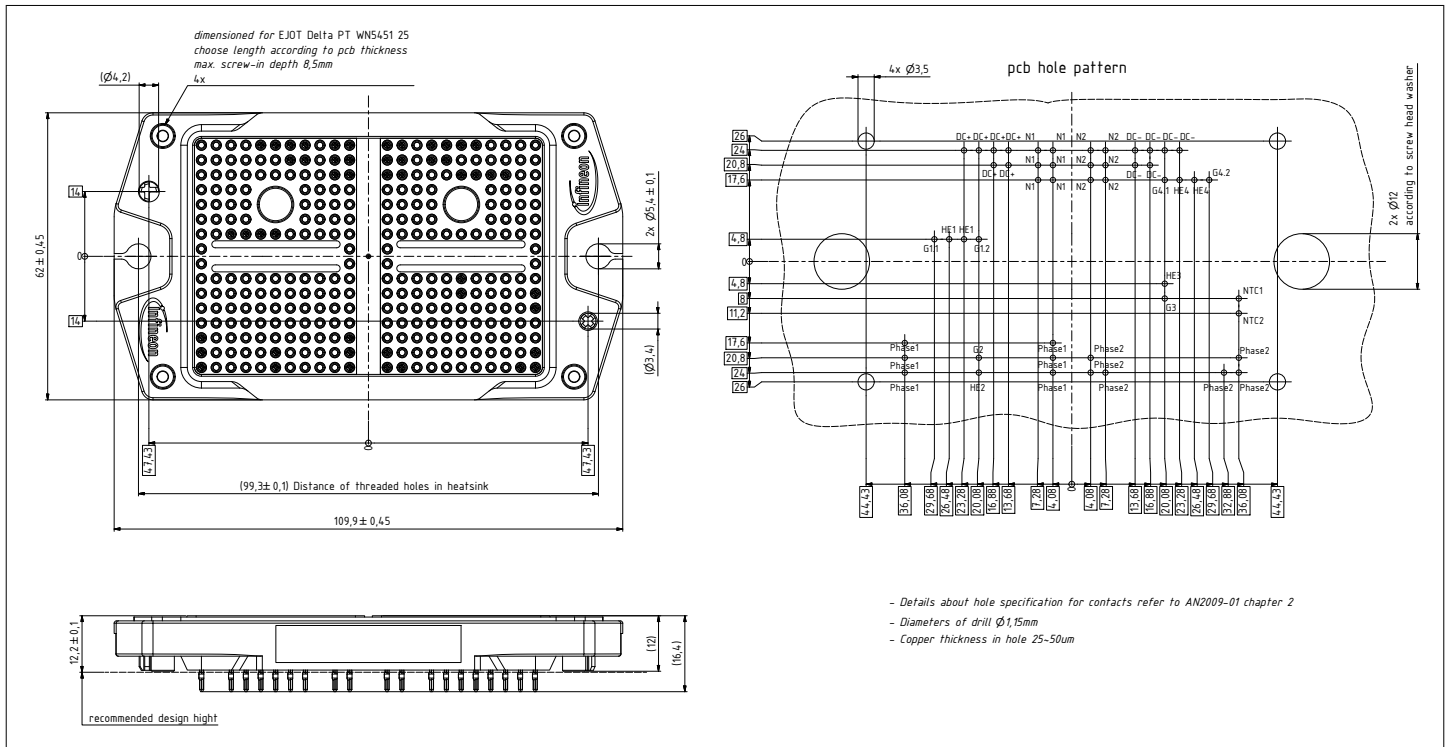


Figure 3

11 Module label code

| Module label code | | | |
|-------------------|-----------------------------|-----------------|-------------------------|
| Code format | Data Matrix | Barcode Code128 | |
| Encoding | ASCII text | Code Set A | |
| Symbol size | 16x16 | 23 digits | |
| Standard | IEC24720 and IEC16022 | IEC8859-1 | |
| Code content | <i>Content</i> | <i>Digit</i> | <i>Example</i> |
| | Module serial number | 1 - 5 | 71549 |
| | Module material number | 6 - 11 | 142846 |
| | Production order number | 12 - 19 | 55054991 |
| | Date code (production year) | 20 - 21 | 15 |
| | Date code (production week) | 22 - 23 | 30 |
| Example | | | |
| | 71549142846550549911530 | | 71549142846550549911530 |

Figure 4

Revision history

Revision history

| Document revision | Date of release | Description of changes |
|--------------------------|------------------------|-------------------------------|
| 0.10 | 2021-04-28 | Target datasheet |
| 1.00 | 2021-06-25 | Final datasheet |

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Edition 2021-06-25

Published by

Infineon Technologies AG

81726 Munich, Germany

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IFX-AAS474-002

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